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BEHAVIORAL GERONTOLOGY AND GAMBLING: THE JACKALOPE OF BEHAVIOR ANALYSIS

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Older adults constitute over one third of all gamblers in the United States. As the baby-boom generation continues to reach older adulthood, this proportion is likely to grow. To date, behavior-analytic research on gambling has focused on younger populations. Although such research is necessary and important, the present account will suggest that additional research should focus on studying older gamblers. The purpose of the present account is to review the literature that exists on typical behavior changes observed in older-adult populations and the implications for those changes related to current behavior-analytic research in gambling.

Keywords: Behavioral Gerontology, Gambling, Behavior Analysis

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Behavior analysts have long noted the importance of conducting research with adults over the age of 65 (Lindsley, 1964). Generally referred to as older adults, this group is typically split into three categories: (a) the young-old (those age 65 to 74); (b) old or middle-old (those age 75 to 84); and (c) old-old or oldest-old (those 85 or older). Behavioral gerontology focuses on the application of behavior-analytic principles to address changes related to aging and older adults (Adkins & Mathews, 1999). Over the past 46 years, behavioral gerontologists have addressed issues in the basic understanding of behavior principles with older adults, the ways in which clinical applications can ameliorate behavioral excesses and reinstitute behavioral deficits, and how organizational behavior management can improve systems that serve older adults (LeBlanc, Raetz, & Feliciano, in press). Despite a steady (albeit fairly low) flow of research in behavioral gerontology (Buchanan, Husfeldt, Berg, & Houlihan, 2008), one area that has not been addressed is gambling. The study of gambling behavior in older adults can be approached from two different angles: a) the benefits of recreational gambling and b) pathological gambling. Although behavior analysts have not addressed the gambling behavior of older adults, a rich and growing body of literature focusing on behavior analysis and gambling provides a solid foundation upon which to build the field's understanding of such behavior.

This proposed combination of research focusing on older adults and gambling is truly the Jackalope of behavior analysis. A Jackalope is a mythical creature believed to be the result of a crossbreed of deer or antelope and a jackrabbit (that is sometimes described as being killer). Despite the wealth of fiction related to Jackalopes, there is some fact to the existence of the creature itself, as a form of the papillomavirus that affects rabbits, called cottontail rabbit papillomavirus (CRPV; Christensen, 2005) can cause warts that become bonelike in nature (Giri, Danos, & Yaniv, 1985), and could be mistaken for antlers in a jackrabbit. Although interesting, it is

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quite saddening that more empirical research exists related to a rare breed of an extinct pygmy-deer and a species of killer-rabbit than on the gambling behavior of older adults.

The purpose of this paper is to propose a combination of two relatively small, yet important, areas of behavior-analytic research: research on gambling and research on older adults. This is not to say that the behavior of older adults is in some way different from the operant and respondent behavior of any other organism, but that there are biological changes (e.g., pain related to chronic illness can create abolishing operations for engaging in once preferred tasks that involve physical activity) and environmental changes (e.g., environmental contingencies that support dependence rather than independence and the decreased salience of discriminative stimuli) that occur specific to older-adult populations and affect the ways in which behaviors occur (LeBlanc, Raetz, Feliciano, 2008; Skinner, 1983). Indeed, Skinner argued that contingencies of reinforcement tend to support different behaviors as adults age and that stimulus control weakens as adults age. As such, the study of older-adult behavior would yield important information. Despite the many potential benefits of such research, to date there have been few, if any, such studies. The focus of the paper will be to first cover what is currently known about the behavior of older adults and how that can impact current research on gambling. The subsequent review will focus on three areas: a) activities and engagement in aging; b) principles of reinforcement and stimulus control related to aging; and finally c) pathological gambling in older adults.

Research on Gambling with Older Adults

Reports (National Research Council, 1999) estimate the proportion of gamblers over the age of 65 to be about 27% in the United States. The highest proportion of gamblers is those age 50 – 65, which accounts for over 30%. Thus, gamblers age 50 and over account for more than half of all gamblers. Within the gerontology literature, researchers (e.g., Preston, Shapiro, & Keene, 2007) have noted that successful aging for those over the age of 65 involves minimizing illness and loss of function (both physical and cognitive) as well as maximizing engagement in activities within the community. Research supports the idea that engaging in activities within the community can actually help to decrease the chances of illness and loss of function (Preston et al., 2007). However, as adults age the chances of becoming socially isolated increase (Vander Bilt, Dodge, Pandav, Shaffer, & Ganguli, 2004). Recreational gambling activities (e.g., going to Bingo or a casino) provide older adults with opportunities for social interaction within the community and cognitive stimulation in the form of engagement in mathematical tasks (National Research Council, 1999; Vander Bilt et al., 2004). Indeed, researchers have found that gambling can result in improved physical and mental health for older adults (Desai, Maciejewski, Dausey, Caldarone, & Potenza, 2004; Vander Bilt et al., 2004). For example, older adults who engage in regular recreational gambling activities appear to have lower incidence of depression, greater social support, and higher cognitive functioning (Vander Bilt et al., 2004). Thus, by maintaining activities within the community that provide stimulation and deter physical and cognitive decline, it is possible for older adults who engage in recreational gambling to be seen as aging successfully (Preston et al., 2007; Quadagno, 2005). Although there are many benefits to gambling, there is also a potential for abuse (Zaranek & Litchenberg, 2008). Research indicates that pathological gambling does exist among older adults. Studies (National Research Council, 1999) indicate that those over the age of 65 as a whole have the lowest levels of pathological gambling. However, older adults who do engage in pathological gambling are likely to have decreased physical and mental health

(Erickson, Molina, Ladd, Pietrzak, & Petry, 2005). In addition, they are likely to be of lower socio-economic status, which is often exacerbated by losing money during gambling (National Research Council, 1999).

Despite the fact that gerontologists have begun to focus their research efforts on the study of older gamblers, examples of such research in behavior analysis are scarce. Indeed, at the time of this publication it is difficult to find even one study in behavior analysis that has focused on older adults specifically as the target populations. One study soon to become public by Dixon, Nastally, and Waterman (in press) demonstrates a very simple application of behavior analysis to the gambling behavior of older adults. The study, conducted in a nursing home, focused on indices of happiness during gambling activities. Participants were first exposed to different stimuli (animals, food, letters, people, and casino games) in a visual paired-choice format preference assessment. Following the preference assessment, participants were exposed to games on a laptop computer that simulated analog gambling. Data on indices of happiness indicated that all participants displayed higher percentages of intervals with indices of happiness during engagement in gambling activities than during baseline, though the effects were not observed once the activities were concluded (Dixon et al., in press).

In sum, a search of published behavior-analytic research focusing on the gambling behavior of older adults yields few results. Research on the gambling behavior of older adults could first and foremost benefit older adults by expanding current technology for providing preferred activities. In addition, methodologies used for gambling research could be utilized to provide valuable insight into reinforcement and stimulus control changes that occur with aging, leading to improvements in interventions that could be used to treat pathological gambling. Finally, such research could help to expand both the fields of behavioral gerontology and behavioral analysis of gambling. The following section provides some background information related to three areas that might benefit from behavior-analytic research on gambling with older adults: a) activities and engagement; b) understanding the effects of reinforcement and stimulus control in older adults; and c) the behavior of pathological older adult gamblers.

Current Research on Older Adults and the Impact for Behavior-Analytic Research on Gambling Activities and Engagement

A number of behavior-analytic studies have focused on increasing engagement in activities by older adults (e.g., Carstensen & Erickson, 1986; Gallagher & Keenan, 2000ab; McClannahan & Risley, 1975). Much of the research began as antecedent interventions that could supplement the living environment to foster engagement in activities (e.g., rearranging the room in which activities occurred, serving cookies during activities, etc.). Nursing homes, in particular, often have low levels of engagement. For example, McClannahan and Risley (1975) conducted a study to increase activity engagement in nursing home settings and found that during baseline, social interaction averaged 13% and activity engagement averaged about 36% (observations were conducted once per hour for 13 hours, 5 days a week for 2 weeks). Older adults with dementia in particular often engage in few activities. More recently, researchers have moved from the physical environment arrangement toward utilizing preference-assessment methodology (Hagopian, Long, & Rush, 2004) to increase engagement in nursing home residents. LeBlanc, Cherup, Feliciano, and Sidener (2006) demonstrated items identified using a pair-stimulus preference-assessment methodology could effectively lead to engagement in older adults. LeBlanc, Raetz, Baker, Stroebel, and Feeney

(2008) demonstrated that an informant based preference assessment could also identify activities that lead to engagement.

One limitation of many of the items that older adults (with or without dementia) might engage with at a nursing home is that access to items is typically staff controlled. Although research has shown that written feedback and training can increase the number of activities offered to staff (Engelman, Altus, & Mathews, 1999), there are still times when staff cannot be available to interact with residents. In addition, nursing home staff are typically expected to focus more on tasks related to care (e.g., toileting, feeding, bathing, transportation) than on providing activities. Gambling activities, such as the video-based slot machines, standard video poker, roulette, blackjack, and craps offered in Dixon et al. (in press), could serve as activities that residents might engage in with minimal staff involvement (e.g., in times when staff must provide care for other residents). A similar version of this currently exists in nursing homes – Bingo. However, even during Bingo, one staff member must call the numbers while others assist those who need it (e.g., helping to put chips down when needed, calling out "Bingo", etc.). Automated simulated[1] gambling games, which require little to no staff involvement and therefore offer prolonged engagement opportunities might prove beneficial in nursing home settings. Such activities can be engaged across a wide range of functioning levels, such that more residents may be able to engage in the activities (e.g., those with dementia). The preliminary reports from Dixon et al. (in press) suggest that older adults not only like engaging in simulated gambling, but that they will do so for as much as 20 minutes at a time. Future studies, similar to those conducted by LeBlanc and colleagues, that focus on level of engagement without staff mediation with longer durations (i.e., more than 5 minutes) might help to determine whether activities like gambling might serve as alternatives to the more standard "group" activities typically offered at nursing homes. Although one benefit of such activities is that they involve less social interaction from staff, it would be important for researchers and clinicians to stress that such activities should not be used as a substitute for staff involvement. Such substitution might result in even lower levels of staff engagement than currently exist.

[1] Although one of the potential reinforcers associated with gambling is the chance to win money, many nursing homes have restrictions on money related to Medicaid payments, potential hoarding of money, and disputes that might arise when two residents claim that money belongs to them and not the other person.

Reinforcement and Stimulus Control

The overall body of literature on basic research with older adults, specifically related to reinforcement and stimulus control, is limited (LeBlanc et al., in press). However, some trends have emerged as a result of the research that has been conducted. Two areas where some trends have emerged are related to the effects of reinforcement on the behaviors of older adults and the impact of stimuli on those behaviors, specifically that the behavior of older adults is sensitive to reinforcement (though perhaps differently than younger adults) and that stimulus control, although perhaps not as strong, is still possible. The following section reviews the literature supporting these findings and discusses how these findings could be important to gambling research.

Plaud, Plaud, and Von Duvillard (1999) examined the effects of reinforcement on the behavior of older adults (ranging in age from 60 to 79) in the context of behavioral momentum. That is, following a period of reinforcement for a specific response, they altered the amount of reinforcement provided to determine the effect on behavior. Fifteen older adults served as participants for the study. Each participant was seated in front of a com-

puter and instructed to press the F1 key or the F12 key. A large green disc, presented on the screen, was associated with 10 tokens and a large red disc, also presented on the screen, was associated with 1 token (both keys were on a fixed-interval (FI) 45-s schedule). The two discs were associated with either the F1 or F12 key, depending on group assignment (i.e., for one group the F1 key was associated with the green disc whereas for the other group it was the F12 key). Following a three-week training, participants were placed into one of five experimental conditions (i.e., the schedule on each button went from a FI 45-s schedule to the following): a) multiple schedule variable-interval (VI) 30 s; b) multiple schedule VI 60 s; c) multiple schedule variable-time (VT) 30 s; d) multiple schedule VT 60 s; and d) extinction (EXT). Overall, participants made significantly more responses on the green disc than on the red disc in the experimental condition, indicating that older adult behavior was sensitive to reinforcement density. In turn, even when reinforcement was no longer available for any response (as in the case of the VT & EXT schedules), participants still responded more on the green key than the red key (Plaud et al., 1999).

Plaud et al. (1999) also compared the results of their study with the results of a previous study (Plaud, Gaither, & Lawrence, 1997) that involved first-year college students. They found that the older adults allocated less overall responding to the keys than college students and that more older adults responses were biased toward the green key (i.e., allocated more responding to the green key than the red key). These results indicate that the behavior of the older adults was more sensitive to the changes in schedules (e.g., when extinction was implement, older adults tended to respond less than college students), but persisted longer on the key that had been associated with higher levels of reinforcement (i.e., although they responded less, more of their responses were allocated to the key associated with the green disc rather than the red disc).

A few studies have examined sensitivity to reinforcement and stimulus control within more complex preparations. These have typically been conducted using conditional discriminations in the form of stimulus equivalence or a signal preparation related to Signal Detection Theory (SDT; see below for description). Three studies have looked at performance of older adults in the context of stimulus equivalence. Stimulus equivalence refers to a summary of observed regularities with three formal properties: reflexivity, symmetry, and transitivity (Sidman, 1997). Teaching conditional discriminations results in the emergence of untaught conditional discriminations that conform to these properties (Sidman, Wayne, Macguire, & Barnes, 1989). When reflexivity (A=A), symmetry (if A=B, then B=A), and transitivity (if A=C and B=C, then A=C) are reliably shown between stimuli, then they are said to be part of the same equivalence class (Sidman & Tailby, 1982).

Wilson and Milan (1995) studied stimulus class formation in 20 adults over the age of 62 (ranging in age from 62 to 81) and compared their results to 20 participants between the age of 19 and 22. Only 9 of the older adults demonstrated equivalence. Overall trials to criterion were higher for the older adult group, though the 9 older adults who demonstrated equivalence actually had lower trials to criterion than the younger adults who demonstrated equivalence, even though their response latencies were higher. Wilson and Milan noted that there may have been other stimuli that affected responding, including fatigue, attending to inappropriate stimuli, and decreases in memory. In another study, Perez-Gonzalez and Moreno Sierra (1999) included 6 participants over the age of 64 (ranging in age from 65 to 74) in their study on the formation of equivalence relations. All 6 demonstrated symmetry, reflexivity and transitivity, though they typically had more errors during

both training and testing, as well as took longer to master the baseline conditional discriminations, than the four participants under 64. Finally, Saunders, Chaney, and Marquis (2005) attempted to demonstrate equivalence in 12 older adults (ranging in age from 56 to 89). Following training, 9 of the 12 participants demonstrated equivalence. In a second experiment, 6 additional older adults were trained using a 0-s delay following the presentation of the sample stimulus and the response options. This modification resulted in fewer trials needed to demonstrate equivalence.

Another preparation that researchers have used to assess the effects of reinforcement and stimulus control with older adults is SDT. There are three main variables that can be manipulated in a SDT preparation: a) the probability of the signal; b) the reinforcer or punisher ratio; c) and the signal strength (Nevin, 1969). The typical SDT preparation involves a simple discrimination task presented in discrete trials. In each trial, the participant is presented with one of two or more forms of stimuli: a noise stimulus (S0) and one or more noise-plus-signal stimuli (S1, S2,…Sm). In an auditory preparation, for example, the S0 might be an 8000 Hz tone, whereas the S1 might be the same 8000Hz tone, but also a 3000 Hz tone (an S2 might be a 12000 Hz tone and so on). The participant has two or more forms of responding (typical operandum is a button or key), corresponding to each form of stimulus; for S0, the correct response would be R0 (the experimenter would determine a priori which response is associated with which button) and for S1 the correct response would be R1. Correct responses result in a putative reinforcer, sometimes on a fixed-ratio 1 or on a VI schedule.

Plaud, Gillund, and Ferraro (2000) provide one demonstration of the effects of reinforcement and stimulus control on older adult participants using SDT. In their study, six participants (ranging in age from 62 to 74) were presented with a computer and keyboard. When the computer screen displayed a white circle, participants were to press the F1 key (which was reinforced with $0.10 and verbal praise on a VI 30-s schedule). When the computer screen displayed a red letter “A”, they were to press the F12 key (which was reinforced with $0.10 and verbal praise on a VI 60-s schedule). The response rates of the participants indicated that all of the participants demonstrated increased correct responding (i.e., reinforcement effect). Three of the six allocated responding to denser schedule (i.e., the VI 30 s) and two allocated responding to the leaner schedule (i.e., the VI 60 s). The final participant did not demonstrate statistically significant differential responding. These results seem to support the findings of other studies in that older adults’ behavior is sensitive to reinforcement but perhaps not as sensitive to supplemental stimuli used to establish stimulus control.

In sum, the above findings related to the effects of reinforcement and stimulus control demonstrate that, overall, older-adult behavior is sensitive to reinforcement. Plaud et al. (1999) demonstrated that older adults respond appropriately to differing contingencies. They also found that, although older adults responded less, they were more likely to bias responding to previous schedules of reinforcement. The results of the above studies also indicate that stimuli correlated with the differential availability of reinforcement do control responding, though the impact of stimulus control appears to lessen. For instance, Wilson and Milan (1995) found that stimuli associated with correct responding had less of an impact with older-adult responding than other stimuli. Saunders et al (2005) used a 0-s delay and found that it resulted in fewer trials necessary to meet criteria. One focus of future research would be whether these findings relate to all groups of older adults. That is, the majority of participants in these studies could be classified as young-old (i.e., 65 to 74 years old) and there were not enough middle-

old or old-old participants to begin to determine if additional changes occur past the age of 75. If additional changes exist past the age of 75, researchers might seek to determine whether these are the result of age related changes or cohort effects. Whether these findings related to only the young-old or other groups, the findings are particularly relevant to research on gambling, where schedules of reinforcement and stimulus control have been hypothesized to play a crucial role in gambling behavior.

Rachlin (1990) suggested that the unit of analysis for gambling might be a string of responses related to ratio. Specifically he said, "A history of [responses without reinforcement under large variable-ratio schedules] might conceivably characterize compulsive gamblers" (p. 297). He went on to suggest that the addition of counters or other supplemental stimuli might serve to lessen pathological gambling, as the effects of the gamblers behavior might become more apparent. Such a hypothesis would be interesting to test with older adult gamblers, who appear to respond to varying contingencies more effectively than younger adults (Plaud et al., 1999). Indeed, a gambling preparation might be an excellent platform to provide further evidence related to older-adult sensitivity to reinforcement. Given that gambling is a preferred activity in many older adults, participants might be more willing to sit for the long sessions needed to establish asymptotic responding that are characteristic of more basic preparations. Additionally, the amount and intensity of supplemental stimuli in gambling activities can be controlled through the context of the program used. It might be possible for researchers to add additional stimuli. In the case of slot machines, it may be possible to add additional chances to win to make detection of a "win" more difficult, thus assessing the discriminability of the signal.

In addition to basic preparations, a number of recent studies have looked at derived relations as a potential intervention for pathological gamblers. Given the current research on stimulus equivalence with older adults and the difficulties associated with demonstrating equivalence, it is unclear how interventions like those used by Zlomke and Dixon (2006) or Hoon, Dymond, Jackson, and Dixon (2008) would work with older populations. In both studies, participants were trained relational responding based on the cues of more than and less than. Following training, participants allocated responding to slot machines associated with the more than stimuli, even though the schedule of reinforcement was the same for both slot machines. Whether such a preparation would work with older adults is a yet unanswered question. In addition to the potential difficulty with establishing derived relations, current research indicates that older adults are more likely to demonstrate biased responding, which could provide further confounds for such research.

Pathological Gambling

As noted earlier, adults over the age of 65 appear to have the lowest levels of pathological gambling (National Research Council, 1999). There are, however, still pathological older gamblers. Much of the research on pathological older gamblers focuses on the deleterious effects pathological gambling but presently little has been done to address intervention strategies (Zaranek & Litchenberg, 2008). Behavior-analytic interventions for gambling have begun to move toward a function-based approach for treatment. For example, Dixon and Johnson (2007) developed the gambling functional assessment (GFA) to identify possible variables maintaining gambling behaviors in pathological gamblers. Behavioral gerontology has moved toward a more function-based account of many problem behaviors seen in older adults with dementia (Baker & LeBlanc, in press) and the use of functional assessment methodology for older adult gamblers would be both a natural

and valuable progression. For example, it is unknown whether the functions that maintain gambling in younger gamblers do so for older adults. Miller, Meier, Muehlenkamp, and Weatherly (2009) noted that escape scores on the GFA were strongly related to total GFA scores. Zaranek and Litchenberg (2008) argued that, in urban populations, as much as 30% of older adults are widowed or on government assistance gamble. Older adults, who are more likely to be socially isolated or on a fixed budget (Vander Bilt et al., 2004), might presumably be more likely to engage in gambling for social or tangible functions. In the event that gambling is maintained by social functions, interventions that help adults identify other preferred activities and potential social companions might be prudent. However, if gambling is maintained by tangible functions (i.e., money), interventions designed to enhance stimulus control (i.e., make the amount of money the older adult is losing more salient) and focusing on mediating verbal behavior (see Dixon, 2010, in this issue for a cogent account of remediating verbal behavior associated with near misses) might prove useful. In addition to adults over the age of 65, those ages 50 – 64 might also benefit from such interventions. Indeed, the group of adults age 50-64 might have additional influences to gamble – the need to gamble to supplement or replace retirement funds. Unfortunately, however, at this point there is simply not enough research on older-adult gamblers to make predictions about which interventions might be prudent or effective.

Conclusion

Behavior-analytic research on older adult gambling is the Jackalope of behavior analysis but has great potential. Behavioral gerontologists have demonstrated that many of the current practices in behavior analysis are easily applied to older-adult populations, including preference assessment methodology (LeBlanc et al., 2006; LeBlanc et al., 2008), basic human operant research (Plaud et al., 1999), and functional analysis (Baker & LeBlanc, in press). Gambling behavior in older adults, however, remains relatively unstudied. Current behavior-analytic research on gambling has begun to provide valuable information about the preferences of gamblers and the factors that maintain gambling. Further behavioral research on gambling that focuses on older adults could benefit older adult populations by extending preference and engagement technology to activities that provide cognitive and health benefits. In addition, researchers could begin to identify changes in reinforcement and stimulus control that could directly impact behavioral interventions used to ameliorate aberrant behavior and promote pro-social behaviors. Also, research on pathological older gamblers might not only improve the quality of life for older gamblers, but may provide valuable information as to why pathological gambling is less common among older adults (i.e., information that might begin to parse out cohort effects from aging effects). In addition to helping older adults, behavior analysts who study gambling stand to benefit in a number of ways when working with older adults. First, older adults constitute a potentially large subject pool that is likely to enjoy gambling studies (i.e., participating in a study could be seen as access to a preferred activity). Second, by extending studies beyond college students, researchers can extend the external validity of their studies. Finally, as the baby-boom generation continues to age, the number of gamblers over the age of 65 will continue to grow and skew the average of the typical gambler. Behavior analysts who begin to answer questions about the behavior of older adults related to gambling will be able to provide answers that no other discipline has been able to provide and put behavior analysis on the forefront of treatment for something that could soon become much more pertinent in the public's eye. Such a move would allow behavior analysts to pro-

vide socially relevant treatment and help to move behavior-analytic research on older adults and gambling beyond the mythical realm of Jackalopes and into a respected and sought after science of human behavior.

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